

Tropospheric Working Group Report:

Air Quality (AQ) from Space

Conveners:

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Important Questions**

- 1) How is Aura data being used now for AQ?**
- 2) How useful is the current data for AQ?**
- 3) What are the limitations and strengths of data for AQ issues?**
- 4) What products would AQ folks like to have?**
- 5) Who will fund the development of these data products? NASA?
EPA?**

**** *But the CMAQ meeting is being held this week!***

Introductory Presentations

AQ : *Shobha Kondragunta (via Ken Pickering)*

“What are the satellite data needs of the air quality community?” NOAA/EPA view

Joseph Vaughan

“The AIRPACT AQ Forecast System & NASA Project for Exploiting Satellite Data”

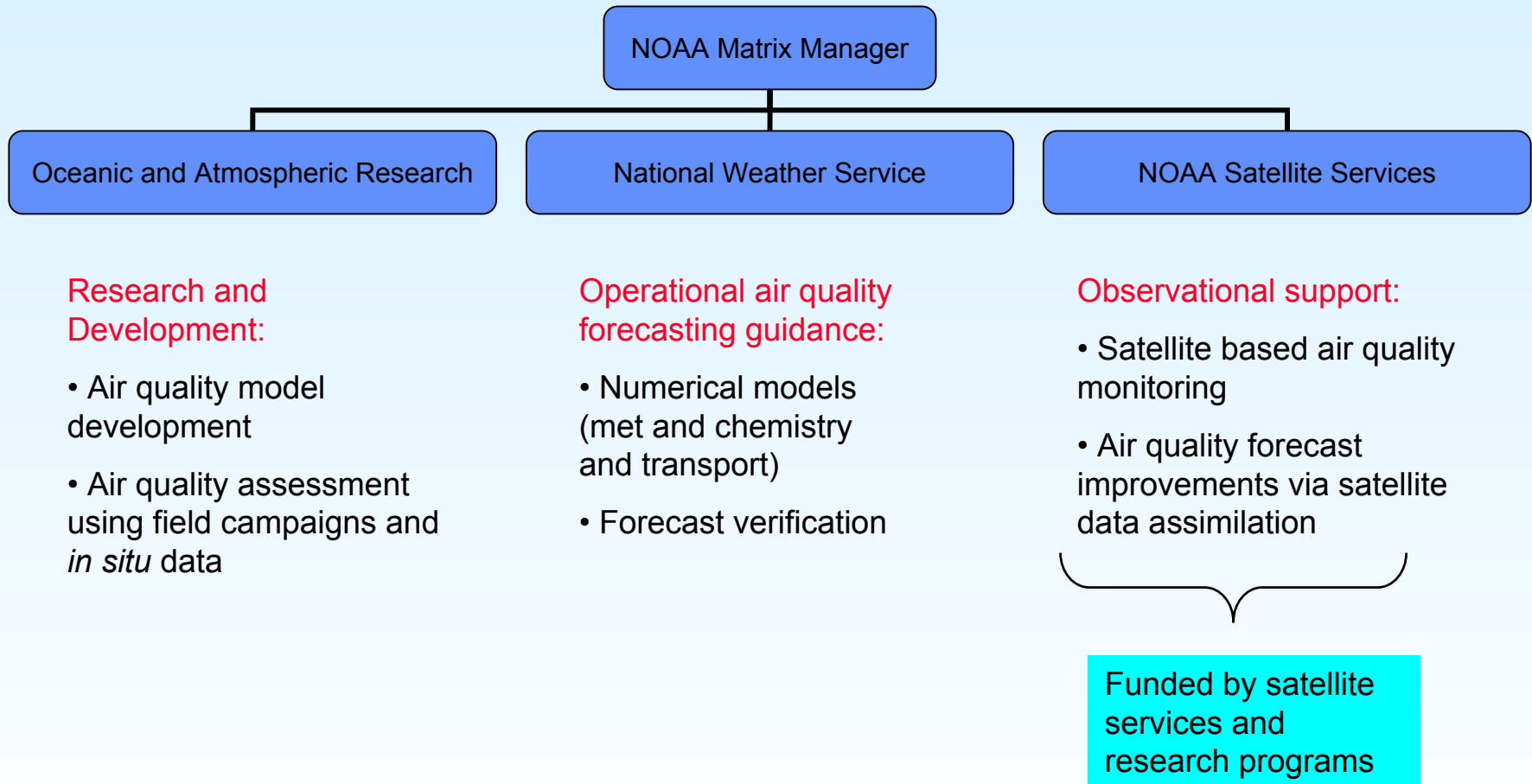
Aerosols : *Mian Chin*

“Possibilities and challenges in using satellite aerosol data for air quality.”

Trace Gases : *Randall Martin/Folkert Boersma*

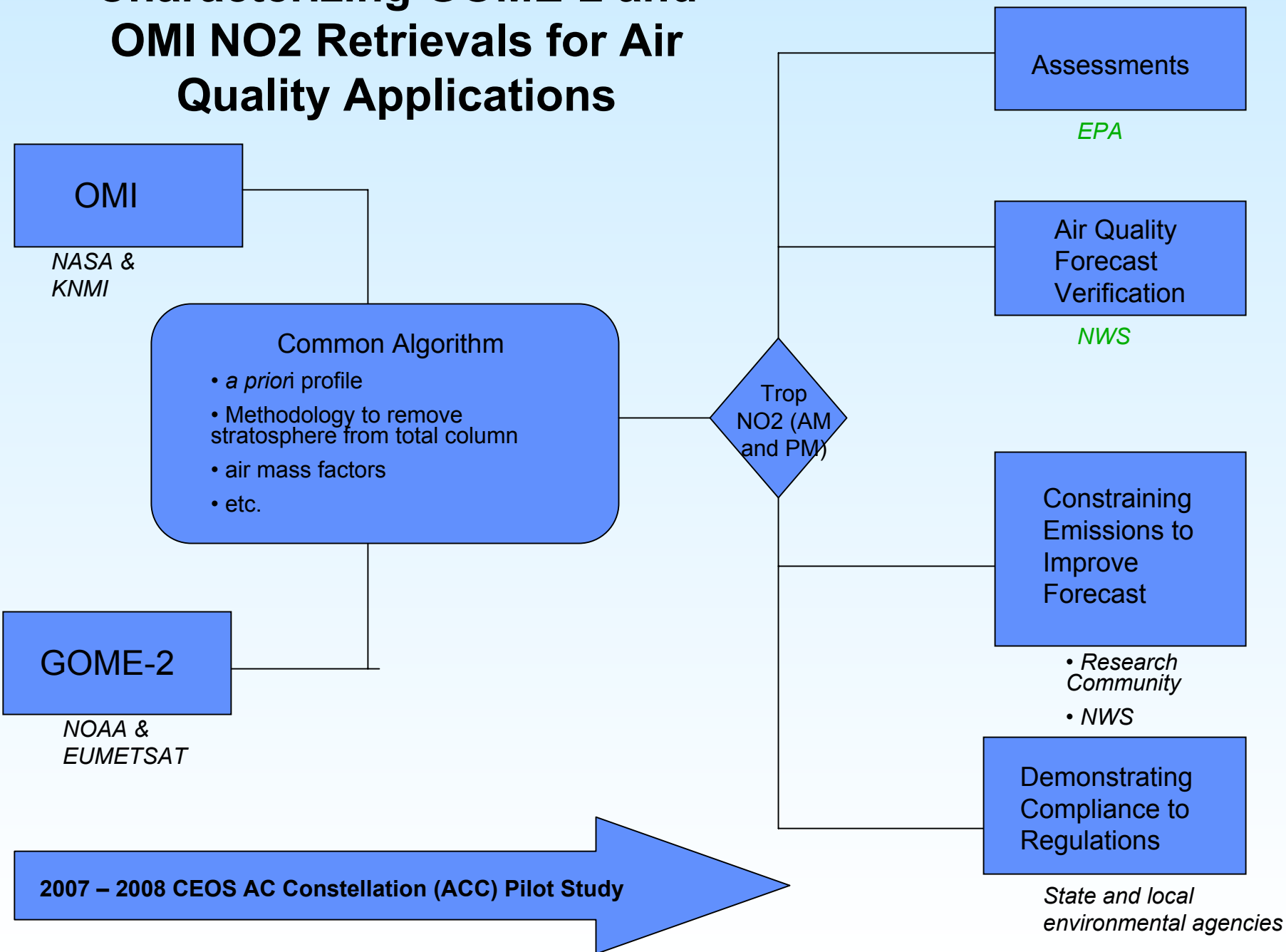
“Successes and challenges in satellite remote sensing of trace gases for air quality applications.”

NOAA Air Quality Program Structure

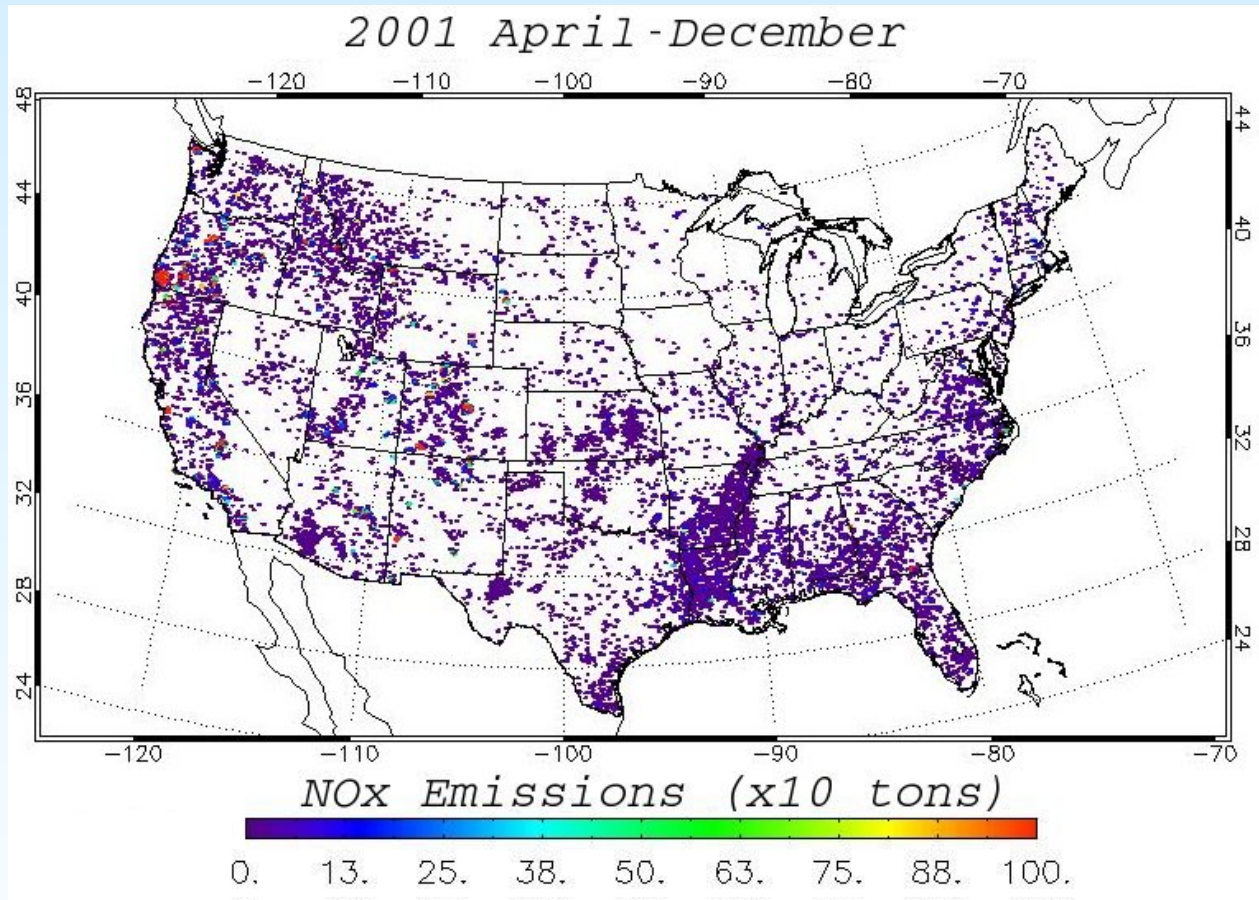


Active collaboration with EPA for over 50 years

Characterizing GOME-2 and OMI NO2 Retrievals for Air Quality Applications



Biomass Burning Emissions



OMI NO₂ product can be very useful to constrain random sources of emissions in an operational air quality forecast model

Challenges

- Scales (local/regional/continental)
 - » Day to day monitoring vs spatial and temporal averaging
 - » Noisy data
- Chemical data assimilation
 - » Not just ozone assimilation?
 - » Ozone + other trace gases + aerosols
 - » Radiance assimilation or product assimilation
 - Radiance assimilation requires fast radiative transfer model in the UV-VIS
 - » Assimilation into global models or regional models
 - Operational global models do not have tropospheric chemistry
 - Regional models need boundary conditions
- Future mission planning
 - » New species (e.g., ammonia)?
 - » Aerosol speciation?
 - » For aerosols, particle size?
 - » Vertical profile?
 - Should we let satellites handle the total column and let *in situ* observations provide the verticality?

Shoba's Summary

Most critical needs:

Common algorithms for processing multisensor data (e.g., NO₂)

More vertical profile information

More interaction between satellite data providers and air quality modeling community

Successes & Limitations of Satellite Data for AQ

Mian Chin on aerosols:

“There is no question that satellite AOD data provide a large scale, dynamic change of aerosol distributions and transport. It is the QUANTITATIVE USE for PM that is challenging.”

AOD is correlated with PM at some times and in some places. *However*, AOD does not give aerosol composition information nor vertical structure of aerosols that is necessary to reliably estimate PM_{2.5} from AOD.

Ben Veihelmann: Showed technique using boundary layer depth and relative humidity to gain a better estimate of surface PM_{2.5} from AOD.

Successes & Limitations of Satellite Data for AQ

Randall Martin on successes for trace gases:

- Long-range transport (e.g., MOPITT CO, OMI NO₂)
- Top-down emissions constraints (e.g., NO₂, Isoprene)

Folkert Boersma on challenges for trace gases:

- Lower sensitivity in the boundary layer (e.g., ozone, CO)
- Boundary layer SO₂ – ozone interference, etc.
- Need for more validation datasets
- Need for more NO₂ profile information
- Need for satellite mission dedicated to AQ

Successes & Limitations of Satellite Data for AQ

Other Successes & Limitations:

Clouds & more clouds!

Separation of boundary layer signal from column above.

PK Bhartia – low sensitivity to boundary layer ozone

D Millet – OMI H₂CO noisy – spatial and/or temporal averaging

N Krotkov – OMI SO₂ – track pollutant plume transport

R Cohen – OMI NO₂ – daily to seasonal variability of emissions

O Torres – AOD to estimate aerosol effects on photolysis rates

H Eskes/P Veefkind – OMI NO₂ assimilation

Why are the various OMI NO₂ products so different?

Eric Bucsela & Folkert Boersma gave a summary of results from the recent KNMI meeting.

Differences in cloud radiance fractions, surface albedo, stratosphere/troposphere separation, AMF, etc.

Currently under investigation between various groups.

Did we answer the “Important Questions”?

- 1) How is Aura data being used now for AQ? *Emission constraints, boundary conditions for models, data assimilation, + others.*
- 2) How useful is the current data for AQ? *Depends on the application. Still being digested by AQ folks, so stay tuned. Fusion of various data products to gain geophysical information (e.g., OMI & MODIS aerosol, TES & AIRS CO, TES & OMI ozone).*
- 3) What are the limitations and strengths of data for AQ issues? *Focus of WG – discussed several important issues.*
- 4) What products would AQ folks like to have?
*Common algorithms for multisensor data.
More NASA – AQ interactions.*
- 5) Who will fund the development of these data products? NASA? EPA?
???

Summary of Tropospheric WG

- ☐ Need to foster more communication between AQ community and NASA concerning the application and proper use of data products for AQ.***